A COMPARISON OF STUDENT SUCCESS IN UNIVERSITY OF WISCONSIN-STOUT'S COMPUTER-BASED AND CLASSROOM-BASED INSTRUCTION

by
John Grupe

A Plan B Research Paper

Submitted in Partial Fulfillment of the
Requirements for the
Masters Degree in Career and Technical Education

Approved 2 Credit Thesis

Dr. Mike Galloy
Thesis Advisor

The Graduate School
University of Wisconsin-Stout
May, 2003

ABSTRACT

The Graduate College
University of Wisconsin-Stout
Menomonie, WI 54751

Grupe	**John**	**Earl**
(Writer)(Last Name)	(First)	(Middle)

A comparison of student success in University of Wisconsin – Stout's self-paced curriculums and traditional classroom based instruction?
(Title)

Career and Technical Education
(Graduate Major)

Dr. Mike Galloy
(Research Advisor)

May, 2003
(Month/Year)

55
(No. of Pages)

Publication Manual of the American Psychological Association, Fifth Edition
(Name of Style Manual Used in this Study)

Technological advancements have brought many possibilities to today's learning environment. It is up to educators to embrace the technologies that have the potential to improve the learning experience for our students. Computer-based delivery of curriculum is one technological advancement that seems to offer many possible advantages for learners. It is this researcher's opinion that if we as educators are going to adapt our traditional classroom practices of a face-to-face, lecture-based learning

experienced and embrace the possibilities that computer-based, self-paced education brings to learners, we must first understand the potential effect this technology will have on the learner.

This study will conduct a correlational study to determine the level of educational success learners demonstrate in courses that are offered in both a traditional classroom-based learning experience and a computer-based, self-paced educational model.

The purpose of this study is to compare the grade point average of students who have enrolled in select courses offered by the University of Wisconsin – Stout in both traditional classroom/lecture-based format as well as computer-based self-paced format during the fall semester of 1999 through the fall semester of 2002. Data will be collected from the student records database maintained by the University of Wisconsin – Stout's Registrar's office during the spring semester of 2003.

ACKNOWLEDGEMENTS

I would like to start these acknowledgements by clearly and resoundingly thanking my bride, Tanya for truly believing in me and encouraging me to pursue my dream of becoming a teacher. I would also like to thank her for the continuous example she provided as a selfless, intelligent, and caring human being who is able to see the best in everyone when everybody else is blinded by their own needs and desires. I hope to bring these traits to my students, as I become a teacher.

I would also like to thank all of my family members (parents, in-laws, wife, and children (Jerel-13 and Kayla-12) as they were the first to identify that I (Dad) was not laughing as much as I usually did. This was do to the stress that I put on myself in my former career. With a resolve to bring my life back to a scenario that allowed me to enjoy life again, I left my old career behind and began studies toward a new and better life for my family and me. A month or two into my studies resulted in comments from all of them like “It’s nice to have the happy person back.” It was these comments and their unconditional love that not only warmed my heart, but also gave me the strength I needed to strive for a successful new career. This also taught me how important it was to choose a career that was not only financially rewarding but emotionally rewarding as well. I hope to instill these values and understanding in my students, as I become a teacher.

I would also like to thank my friends. Even though I left a successful career that many would consider approaching perfection, everyone had only positive words of encouragement and strength. Not a single individual uttered a negative word. I hope to help my students understand the power of a positive attitude, as I become a teacher.

I would also like to thank my instructors at UW-Stout. I can say with complete honesty that I did not meet a single instructor at UW-Stout that I did not respect for their professionalism, intelligence, and caring attitude toward their students. Although UW-Stout is an institution of higher learning, I never felt there was a hierarchy between the professors, staff, and students. Regardless of their educational standing or tenure within the institution, the focus of all efforts remained on what the students need to achieve academic success. Dr. Mike Galloy is a prime example of this educational model. In the classroom his real-life examples, knowledge, and conversational style of presenting bring comfort to the students and great value to the topics of discussion. Out of the classroom he brings a realistic outlook, professionalism, and caring attitude that contributes to every student's success as an individual. I hope to embody these personal and professional traits in order to help all of my students achieve their goals as an individual, a professional, and a member contributing to a greater community, as I become a teacher.

TABLE OF CONTENTS

CHAPTER ONE

Introduction

Technology continually changes every aspect of our lives, including how we educate our children and ourselves. A report prepared for the American Federation of Teachers found that throughout history, technology has had, and will continue to have, a profound impact on colleges and universities in America and around the globe (Phipps & Merisotis, 1999).

Looking back to education in the 15th century, it can be see that the technological advancement of the printing press had a profound effect on how information was delivered to the masses. According to Rubinstein (2003) William Caxton set up England's first printing press in 1476 and started a revolution in how the general public was educated. Suddenly, there was a cost effective method to produce written documents that could be used to educate the public about current, as well as historical events. Prior to the advent of the printing press, the need for the general public to have reading skills was minimal and the majority of education was conducted verbally. This brought about a paradigm shift toward the education of a highly illiterate general public.

According to Tyson (2003) the Lumiere brothers, Louis and Auguste, created the cinematograph, which was the first movie projector in the late 19th century. This brought about a new technological change in education. With the use of the movie projector, educators could not only present information in a new and visually interesting way, but they could transform the classroom into an infinite number of locations. If the students were studying World War II, the teacher could bring visual images into the classroom to help the students gain a better understanding of the ravages of war and how it affected the

people involved. The use of movies made the educational experience much more real for the students, therefore having a greater impact on their learning experience.

In the latter part of the 20th century computer technology brought limitless volumes of information to students in a very timely manner. People are now able to research virtually any topic in a much more efficient manner than ever before. Computer technology has also made the world a much smaller place by facilitating communication with individuals on the other side of the world with the click of a mouse button and some basic keyboarding skills. The curriculum development community has also embraced computer technology. The creation of self-paced curriculum delivered via computer allows learners to participate in the learning experience from virtually any time and location in the world (Mariani, 2001). It also allows learners to conduct their educational experience during a time that is convenient for them as individuals.

Technology has the potential to drastically change the concept of a classroom by allowing the students to completely immerse themselves in a learning experience (Ruzena, n.d.). The teacher/student relationship becomes one of mentor and apprentice rather than that of lecturer and receptor of knowledge. Sandra Kerka stated that technology is changing how humans learn. The use of new technological tools available to teachers and students is increasing intrinsic motivation, critical thinking and self-direction at increasingly younger ages (Kerka, 2002). The students become more responsible for their own academic growth, with the teacher serving as a guidance counselor whose responsibility is to help students achieve their individual educational goals. Technology allows the educational walls to come down. Teachers have to become facilitators of information and critical thinking by providing guidance to students (Cerf,

V., Schultz, C, n.d.), not the keepers of knowledge. Classroom instruction has been the primary method to deliver curriculum to the learner for many years. The recent development of tools such as television, computers, and the Internet allows educators to utilize alternative methods to deliver the curriculum to the learner (Jewett, 2000).

Although education has embraced the use of technology throughout history, it is this researcher's opinion that educators have not utilized technology to its greatest potential effect. As Rod Paige, Secretary of Education, stated in his preface for the 2020 Visions, transforming education and training through advanced technologies report…(US Department of Commerce, 2002, n.p.):

> The problem is not that we have expected too much from technology in education – it is that we have settled for too little. Many schools have simply applied technology on top of traditional teaching practices rather than reinventing themselves around the possibilities technology allows.

Technological advancements have brought many possibilities to today's learning environment. It is up to educators to embrace the technologies that have the potential to improve the learning experience for our students. Computer-based delivery of curriculum is one technological advancement that seems to offer many possible advantages for learners. If educators are going to adapt our traditional classroom practices of a face-to-face, lecture-based learning experience and embrace the possibilities that computer-based, self-paced education brings to learners, we must first understand the potential effect this technology will have on the learner.

Statement of the Problem

Little research has been conducted at the University of Wisconsin – Stout that explores the existence of a correlation between student success and the method of curriculum delivery. Since educators are responsible for providing the best learning experience possible for each of our students, it is important to gain an understanding of the benefits of various curriculum delivery mechanisms. This understanding will allow educators to discern between the tools that will provide the greatest benefit for the students. By studying the benefits of computer-based learning as it compares to traditional classroom/lecture based learning, this study will provide the information that educators need to make well informed decisions regarding the best delivery mechanism for their students.

Purpose of the Study

The purpose of this study was to compare the grade point average of students who had enrolled in select courses offered by the University of Wisconsin – Stout in both traditional classroom/lecture-based format as well as computer-based self-paced format during the fall semester of 1999 through the fall semester of 2002.

Questions to be Answered

This study attempted to answer three questions regarding student success in computer-based courses:

1. Is there any correlation between student success and the method of curriculum delivery (traditional classroom/lecture vs. computer based self-paced)?

2. Is there a relationship between student gender and success in traditional classroom/lecture courses?

3. Is there a correlation between student gender and success in computer-based self-paced courses?

Significance of the Study

This study has importance for various reasons…

1. Confucius (n.d., n.p.) say:

"Learn avidly. Question repeatedly what you have learned. Analyze it carefully. Then put what you have learned into practice intelligently."

The above quote can be applied to this study as follows:

Learn avidly…Educators should approach computer based self-paced curriculum delivery with enthusiasm and vigor.

Question repeatedly… Educators should study computer based self-paced curriculum delivery until a full understanding of the potential benefits is gained.

Analyze it carefully… Educators should conduct research to test their level understanding.

Practice intelligently… Educators should implement computer based self-paced curriculum delivery only where it is relevant and proven to be effective.

2. Instructors at the post-secondary level will be able to utilize this study to gain a better understanding of the benefits and limitations of computer-based, self-paced curriculum delivery as compared to traditional classroom/lecture-based curriculum delivery so that he will be able to utilized this new educational tool to provide a better learning experience for his students.

3. This study will provide new understanding to the body of educational knowledge so that other educators can benefit from it.

4. Students could gain insight into the differences found between computer-based learning as it compares to traditional classroom/lecture based learning.

5. Administrators could use the information discovered in this study to help them make decisions regarding scheduling of course offerings.

Assumptions

The following assumptions were identified in the progress of this study:

1. This study assumes that the data received from the University of Wisconsin- Stouts Registrar's office is accurate.

2. This study assumes that the curriculum for the traditional classroom/lecture based courses and computer based, self-paced courses is similar.

3. This study assumes that the grading system is similar between the traditional classroom/lecture based courses and computer based, self-paced courses.

Limitations

The following limitations were identified in the progress of this study:

1. This study is limited to the student population enrolled in the specified courses during the fall of 1999 semester through and including the fall of 2002 semester.

2. The specified courses are conducted in varying departments, which may have different grading criteria.

3. The specified courses are conducted by varying instructors. Therefore the grading rubric utilized may differ.

Definition of terms

The following definitions were identified in the progress of this study:

1. Student: Any individual enrolled at the University of Wisconsin-Stout in one or more of the courses selected as part of this study.

2. Student Success: As determined by grade point average

3. Traditional classroom/lecture based course: Any learning experience that is conducted in a classroom setting and facilitated by an instructor.

4. Computer-based: Any curriculum that is delivered via a computer with little of no interaction with faculty.

5. Self-paced course: Any course in which the rate at which an individual wishes to complete an instructional unit is entirely controlled by the learner. There is usually a suggested target time frame in which to complete most modules, as well as an expected completion date (Stout Solutions, n.d., n.p.)

6. Grade Point Average: Computed by dividing the total number of grade points earned by the total number of credits attempted. (University Registration, n.d., n.p.)

7. University of Wisconsin – Stout: University of Wisconsin Stout was founded in 1891 and currently serves more than eight thousand students from around the world. The University offers students learning opportunities in business, industry, technology, education, human development, and art and design. (University Relations, 2000, n.p.)

CHAPTER 2

Literature Review

Introduction

This chapter investigates computer-based learning from a historical context. The literature review will take a look at the early beginnings of computer-based learning and how those beginnings evolved into the current use of computer-based curriculum delivery tools. It will also look into how students, educators, and administrators have been affected by the realm of computer-based learning.

According to research by Frank Jewett:

> Classroom instruction (based upon classroom technology) has been the primary mode of instructional delivery in higher education for many years. The advent of electronic media (especially TV, computers, and computer networks) is facilitating the development of alternative instructional delivery modes. (2000, p. 115)

The Mainframe Computer in Education

One of the first uses of computer-based learning was on the campus of MIT in 1950 as students took part in computerized airplane flight simulations (Pruitt-Mentle, 2001). This activity took place on an IBM mainframe computer. In the late 1960's Computer-based learning came into existence in some high schools through the use of mainframe computers that powered "dumb" terminals (Pruitt-Mentle, 2001). The students were treated to a small computer screen which often had green text displayed for their educational experience. This experience proved to be somewhat less than rewarding for the average student, so the primary users of computer-based learning were based in

the scientific community. Another factor that limited the use of mainframe computers for educational purposes was the expense of operating and maintaining the massive systems. Scientific research facilities, both private and public such as universities, were the only institutions capable of justifying the initial setup costs, as well as the substantial ongoing maintenance fees.

Early computer based learning experiences were primarily focused on learning about the computer itself. Students were able to read about the history of the computer and take tests on the computer screen. When they had mastered this level of education (as determined by our passing of the on screen tests) the students were allowed to move on to lessons regarding how to write programs in the language that the computer could understand, such as Cobol, Fortran, and Pascal. The use of this new technology was exciting for some of the students and completely boring to others.

The Personal Computer in Education

Computer-based learning didn't gain public notoriety until the 1980's when the processing power of the mainframe computer was harnessed in a much smaller device known as the personal computer. In 1982 Time Magazine recognized the importance of personal computers by naming it Machine of the Year.

West Point Naval Academy was one of the first academic institutions to take advantage of the benefits offered by computer technology in the learning environment by issuing a computer to every student and providing access to classroom, lab and other resources starting in 1982 (Wilson, 2002). The advent of the personal computer meant that the cost of purchasing, operating and maintaining a computer was considerable less than that of a mainframe computer. Because of the substantial cost savings, it became

realistic for educational institutions to utilize this new tool to improve the educational experience for their students. The primary educational use of computers during this time frame was for "drill-and-practice" skills (North Central Regional Educational Laboratory, n.d.). This use of the computer quickly became know as drill-and-kill. When the students learned that this new thing called computer-based learning was actually the same experience as flash-cards without the added benefit of working with one of your friends, the tendency for student's excitement for learning was quickly killed (North Central Regional Educational Laboratory, n.d.).

In the 1990's, the focus of computer-based education changed again. Rather than playing the role of a curriculum delivery mechanism, computers evolved into learner-centered tools that allowed students to customize their learning experience to their personal interests and abilities. This also allowed students to work together to produce a common product in scenarios that mimicked real work experiences. Another key to the expansion of computer-based learning in the 1990's was the digitization of many formats of information. Computer-based learning was no longer tied to the textual world. Digitized images allowed students and educators to partake in a much richer learning experience by supplementing the textual information with sound clips, pictures, charts, graphs, video images, maps, and computer-generated animations. The addition of these new mediums meant that computer-based education was now a viable alternative for many different learning styles (North Central Regional Educational Laboratory, n.d.).

Along with the digitization of information came another development of the 1990's that had a great effect on the use of computer-based learning, the publishing of digitized information on the Internet. The power of Internet access brought a paradigm

shift to computer-based learning. The following are only a few of the many benefits learners experience through the integration of Internet access in the computer-based learning environment.

1. Through the use of the Internet, computer-based learning is able to leave the walls of the classroom and explore a wealth of information that exists throughout the world.

2. The Internet allows easy access for students to collect information from a seemingly endless electronic library. Rather than searching through an entire book off of a traditional library's shelf, the student's are able to electronically peruse the text of a book to quickly find the portion of the text that is relevant to their topic. This promotes organizational skills and efficient use of time.

3. The Internet allows students to interact with individuals outside of their normal circle of reach (Romiszowski & Mason, 1996). Access to people from differing cultures allows students to gain a broader understanding of the topic being discussed.

4. The relative ease of searching for information via the Internet, and storing that information locally on a personal computer allows students to invest less time on the lower-order thinking skills and mundane tasks of research and more time on the higher-order thinking skills of sorting, evaluating and interpreting how the information is interrelated.

5. Rather than relying on their teacher to provide all of the information relating to a given course, the use of the Internet encourages students to explore alternative sources of information from content experts in the field of study.

The Impact of Computer-Based Learning on Students

The history of computer-based learning has had varied results in regards to its effectiveness in improving the students learning experience.

The impact on students in the early mainframe days of computer-based learning was focused primarily on individuals who wanted to become computer programmers or computer repair technicians. Little effort was put into making the early mainframe-based lessons relevant to the non-computer related careers. They were simply lessons to learn about the computer itself. If the student's had aspirations of becoming a computer programmer, these lessons were invaluable. However, if the student's simply wanted to learn how the computer could help them be more effective in a career unrelated to computer technology, these lessons provided little value. These early computer-based learning experiences could be equated to having to gain the knowledge of how to rebuild an engine before you could learn to drive a car. Although the knowledge of how an engine works can provide some benefit in learning to drive, it is not the key factor in becoming a capable driver.

The advent of the personal computer brought an expanded access and expanded curriculum to the world of computer-based learning. The ever-expanding volume of personal computers in educational institutions and the birth of a new industry whose sole purpose was to develop computer programs meant to enhance the student's learning experience, provided educators with considerably more lessons from which to choose. However, the initial curriculum offerings in computer-based learning provided only a passive learning experience.

Berryman (1993) defined the passive learning experience of the personal computer as:

> Passive learning means that learners do not interact with problems and content and thus do not receive the experiential feedback so key to learning. Students need chances to engage in choice, judgment, control processes, and problem formulation; they need chances to make mistakes. (p. 375)

The passive learning experience found in the early use of personal computers in education resulted in a loss of control for both the students and the educators (North Central Regional Educational Laboratory, n.d.). Students lost control of their learning experience because they were unable to conduct interactive discussions with the computer that resulted in passive learning. Educators lost control of the lessons being taught because they were unable to customize the computer-based lesson for their class needs. Every aspect of the lesson was predetermined by the individual who wrote the program for the computer. Unfortunately, very few computer programmers had formal training in curriculum development that led to poorly designed lessons and an unrewarding learning experience for the students.

The development of computer-based curriculum improved toward the end of the 1980's as researchers and developers of educational software shifted their focus from the manipulation of instructional materials such as drill-and-practice to facilitating learner processing and interaction with the computer-based learning

experience (Saettler, 1990). This change in focus returned some of the control to the learner that was lost in previous efforts to integrate computer-based learning into the existing curriculum. This change in focus also seemed to be the key in showing that computer-based learning could improve the students' educational experience. Various studies showed that the introduction of technology into the classroom was particularly beneficial for students identified as at risk of failure (Griffin, 1991;Wilson, 1993). After technology was introduced into the classroom, these students showed a dramatic improvement in standardized scores.

The Impact of Computer-Based Learning on Curriculum

Through Gardner's theories regarding multiple intelligences, educators have learned that presenting lessons in accordance with varying intelligences can increase the students' chances for successful learning. However, it is virtually impossible for an educator to address each of the multiple intelligences in a single lesson. Therefore educators have settled for addressing various intelligences in various lessons. The interactivity of computer-based learning can address this issue through the use of relational databases that allow educators to reach each of their students in ways that were not physically possible before by adapting curriculum content to meet individual student needs (Hativa & Becker, 1994).

The Impact of Computer-Based Learning on Educators and Administrators

The successful implementation of a computer-based curriculum requires a well-thought-out plan, multi-year financial commitments, and extensive professional development (U.S. Department of Commerce, 2002). Without proper planning, funding, and development, computer-based learning does not seem to extend beyond the currently

practiced educational methodologies (U.S. Department of Commerce, 2002). To take full advantage of the expanded learning opportunities that accompany the capabilities of computer-based learning, administrators and educators need to invest the time to learn about the emerging trends and best practices of computer-based learning and how this technology can be used to enhance the learning experience of students. When evaluating the success of computer-based learning, the technology itself cannot be the single factor in the evaluation. Three factors: hardware, software and teacher education are the keys to success of students enrolled in computer-based courses. In an examination of 40 comparative studies, Ryan (1991) found that teacher education was positively relational to student success in computer-based education. Students enrolled in computer-based courses administered by educators with more that ten hours of professional training significantly outperformed students enrolled in computer-based courses administered by educators with fewer than five hours of training.

Although the anticipated benefits of computer-based learning are great, these benefits are accompanied by a substantial increase in costs. Just as the initial capital outlay required to build brick and mortar facilities to accommodate classroom-based instruction are substantial, the initial capital outlay to build the technological infrastructure required to facilitate computer-based learning is high. The cost of the technological infrastructure and maintenance of equipment in addition to the costs associated with the professional development required for today's educators to understand how to integrate technology into existing curriculums are immense. The watchful eye of local, state, and federal legislators, as well as parents and taxpayers accompanies these increased costs (North Central Regional Educational Laboratory,

n.d.). The key word here is accountability. Legislators and taxpayers are looking for proof that these expenditures are truly improving the educational performance of the students benefiting from this new method of learning.

According to Nicholle Stone, the coordinator of web-based instructional development at the University of Wisconsin – Stout, the use of technology in the classroom has provided a reason for many educators to reinvent themselves as educators (N. Stone, personal communication, March 19, 2003). She has seen a trend at the University of Wisconsin–Stout that shows faculty enthusiastically adopting the use of technology in the classroom because it opens the door to many new resources that were previously unavailable. Ms. Stone attributes the successful implementation of computer-based learning on the UW-Stout campus to three contributing factors.

1. The Chancellor for the university believes that the integration of computer-based learning in both the academic and administrative aspects of education on campus will result in an improved learning experience for the students and has therefore provided the funding for technological tools and the training required to utilize them.

2. The faculty at the university is becoming more comfortable with the use of technology in the classroom and is exited about the new teaching and learning opportunities it brings to the educational experience for the students.

3. As students recognize the benefits technology brings to the learning experience, the students are demanding the use of technological tools by the staff and faculty at the university.

Current Trends in Computer-Based Learning

The research conducted for this study has discovered an explosion in the use of the Internet as the preferred tool for delivering computer-based instruction. According to a 1999 study conducted by the U. S. Department of Education, the use if Internet-based technologies as the means for delivering course work in United States postsecondary institutions has grown from 22 percent to 60 percent between the fall of 1995 and 1998. During that same time period the number of students enrolling in Internet based courses doubled to the 1,661,100 enrollments (L. Lewis, K. Snow, E. Farris, & Leven, 1999).

The University of Wisconsin-Stout has seen even greater growth in the area of Internet-based education. According to Nicholle Stone, UW-Stout offered 12 Internet-based courses during the 2000-2001 academic year. In the past two years, the number of Internet-based courses has grown by a staggering 500 percent to a total of 600 courses being offered in the 2002-2003 academic year.

Ms. Stone also mentioned that she sees integration as a current trend in computer-based learning (Stone, N., personal communication, March 19, 2003). Computer-based learning is no longer considered an end in itself. Educators are utilizing the vast resources found on the Internet, the communication capabilities of computer networks, and the presentation capabilities of personal computers to provide integrated technological learning experience for their students.

The following table outlines some of the technological methods currently being used by faculty to integrate computer-based learning into the educational experience of student's on the UW-Stout campus.

TYPE	Web Presence	Web-Enhanced	Web-Based	Fully Online
PURPOSE	• Presentation of Information • Convenience	• Presentation of Information • Convenience • Supplemental content to course	• Whole units of instruction online • Support for synchronous D.E. --site is imperative to learning	• All course content and interaction occurs online • Course environment is online
FEATURES	• Syllabus • Email	• Syllabus • Announcements • Readings • Resources • Links • Assignments • Lectures • Email • Group communication • Glossary • Bibliography • Discussion Board • Real time Chat	• Listserv • Discussion Board • Security • Multiple instructors • Drop Box • Student tracking • Quizzing • Group projects	• All the tools and features to deliver instruction outside of a traditional brick and mortar environment
TOOLS	Limited use of templates-- • HTML editor • FTP • MS Office OR - • **e-Scholar course delivery tool** • MS Office	Templates-- • HTML Editor • FTP • MS Office • WebBoard OR - • **e-Scholar course delivery tool** • MS Office	Modularized Templates-- • HTML editor • Templates • FTP • CGI scripts • MS Office OR - • **Blackboard** • MS Office	• **Blackboard** • MS Office OR - • HTML editor • Templates • FTP • CGI scripts • MS Office
SUPPORT	WebCamp	• WebCamp • 1-on-1 as needed	• Consultation • WebCamp or Editor training • Utility training (1/2 to 1 day) • 1-on-1 follow-up • Student Support • Entering students	• Consultation • Instructional design strategies for teaching online • Editor training • Utility training (1 to 2 days) • Many 1-on-1 follow-ups • Student support • Entering students

* Bold tools are the recommended tools for most instructors for the corresponding course type (N. Stone, 2003).

The methodologies outlined above help support another trend in computer-based learning, “learning anytime, anyplace” (Mariani, 2001). As the Internet has increased in popularity, availability, reliability, and flexibility, it allows both students and instructors a new medium to partake in the educational experience. “The Internet offers the chance to

provide education anywhere, anytime at overall costs lower than those of early distance education and traditional instructional methods" (Sankaran, Sankaran, and Bui, 2000).

The future of computer-based learning

The future of computer-based learning will most likely evolve just as technology has evolved in virtually every aspect of our lives. The contributions that technology makes in items such as microwave ovens, refrigerators, coffee makers and automobiles is generally unnoticed by most individuals. Technology has been integrated into these items so seamlessly that its contributions are invisible and require no thought on the user's part. The integration of technology simplifies our lives by making our use of these items more convenient. This same trend will most likely continue in the computer-based learning arena. As students and instructors become more familiar with the capabilities of computer-based instruction it will become an integrated and pervasive part of the learning experience.

Trying to identify the future of computer-based learning is a difficult task due to the vast number of technologies being utilized in education. However, in the process of conducting this literature review, some commonality was discovered regarding the following technologies.

1. Broadband technology is an improved method of connecting to the Internet that allows for faster access to information. This provides improved performance in areas such as higher resolution graphics, better quality sound, and faster downloads of large amounts of data. The capacity to support large amounts of data at all times improves the effectiveness of existing distance learning programs by enabling videoconferencing on the computer desktop, facilitating collaborative research projects,

and providing access to high quality course materials from resource around the world (NOIE Access Branch, 2002). Broadband technology also offers additional security and reliability for the Internet user.

2. Media streaming is a technology that compresses audio, video, graphics, web tours, slide shows, or a combination of these into a format that can readily be transferred via the Internet. Prior to this technology, the entire contents of audio or video files needed to be downloaded prior to listening or viewing. Media streaming allows the sound or video images to be viewed as they are being downloaded. Therefore, shortening the time required from the moment that the user clicks on the file for download and the time that they can start to listen to the sound or view the video. Streaming also allows images to be broadcast or viewed from any computer with Internet connectivity. Therefore, increasing the reach and usefulness this technology as a curricular tool (Utah Education Network, n.d.).

3. Mobile learning devices are new technologies that truly facilitate anytime, anywhere learning. The use of these tools when combined with wireless network capabilities literally breaks down the physical walls of learning. Using these portable information tools allows students, teachers and administrators to have access to the world of information stored on their internal networks as well as the Internet regardless of their physical location. The UW-Stout web site identified the following as benefits to mobile learning devices; improves communication, multiplies opportunities for active learning, promotes more interaction and collaboration, enhances flexibility, increases access to university services, improves graduates' critical technology skills, extends credit-earning possibilities (UW-Stout, March 2002).

Conclusion

This researcher found throughout this literature review that administrators, educators, and students are currently in a time of exploration regarding how technology can help them become more capable teachers and learners. As technological tools such as computers, wireless networks, and the Internet become more readily available, more cost effective, and better understood by the general population, the literary body of knowledge seems to agree that these individual technologies will be integrated into an educational tool that will play an increasingly important role in the learning experience of everyone.

CHAPTER THREE

Methodology

Introduction

The purpose of this chapter was to identify the methods used to collect data and analyze that data for statistical significance. The purpose of this study was to compare the grade point average of students who had enrolled in select courses offered by the University of Wisconsin – Stout in both traditional classroom/lecture-based format as well as computer-based self-paced format between the fall semester of 1999 and the fall semester of 2002.

This study is correlational research that determines the level of academic success learners demonstrate in courses that are offered in both a traditional classroom-based learning experience and a computer-based, self-paced educational model. Data will be collected from the student records database maintained by the University of Wisconsin – Stout's Registrar's office during the spring semester of 2003. The Registrar's student records database maintains a substantial list of information relating to student enrollment, scheduling, student demographic information, and academic achievement. The data used for this study included: student age, student gender, student enrollment, course offerings, and academic achievement.

This study will attempt to answer three questions regarding student success in classroom-based and computer-based courses:

1. Is there any correlation between student success and the method of curriculum delivery (traditional classroom/lecture vs. computer based self-paced)?

2. Is there a relationship between student gender and success in traditional classroom/lecture courses?

3. Is there a relationship between student gender and success in computer-based self-paced courses?

Course Selection

The criteria used to select courses for this study was based on the following;

1. The University of Wisconsin–Stout, has offered the selected courses.

2. The selected courses have been offered during the time period beginning with the fall semester of 1999 and ending with the fall semester of 2002.

3. The selected courses have been offered in both traditional classroom/lecture-based and computer-based formats.

4. The selected courses have been offered at least once during the semesters included in this study.

5. The selected courses must have significant enrollment in both the traditional classroom/lecture-based and computer-based formats.

Subject Selection

The subjects for this study were enrolled at the University of Wisconsin-Stout some time between the fall semester of 1999 and the fall semester of 2002. All of the subjects to be used in this study consisted of students enrolled in the courses chosen according to the criteria outlined in the course selection portion of this thesis. The subjects of the study (students) were not directly involved in the study due to the fact that the researcher utilized historical data maintained by the UW-Stout Registrar's office. Although the subjects participated in the study without their knowledge, they were

protected by the UW–Stout Registrar's office who acted as the intermediary for the data collection portion of the study. The only risk identified by this researcher is that the UW-Stout Registrar's office will be querying their databases to compile the requested data set for this study. Therefore the possibility exists that student confidentiality could be compromized. In order to minimize the risk to the subjects, the researcher requested that no data containing personal identifiers was forwarded by the Registrar's office to the researcher.

Data Collection

All data was collected with the assistance of the University of Wisconsin–Stout Registrar's office. The initial task was to determine which courses were offered in both traditional classroom/lecture-based format and computer-based format. This was accomplished by obtaining a list of every course and every section offered by the University of Wisconsin–Stout. The list was limited to courses offered during the time period beginning with the fall semester of 1999 and ending with the fall semester of 2002.

The study attempted to find courses offered by each of the departments on the University of Wisconsin–Stout campus in order to obtain a representative sampling of instructors offering courses and students enrolled at the University.

When the initial course filtering had been completed, the researcher looked for courses that had substantial enrollment in order to gain a statistically valid sample.

Data Analysis

Sorting and filtering the enrollment information provided by the Registrar's office in various ways accomplished the initial analysis required for course selection.

1. By sorting the data according to department abbreviation and section number, the researcher was able to determine which courses were offered in both traditional classroom/lecture-based and computer-based formats.

2. The data was then filtered to include only the courses identified as being offered in both traditional classroom/lecture based formats and sorted according to student enrollment.

3. Final selections of courses to be included in the study were chosen from the resulting list according to the criteria outlined in the course selection portion of this chapter.

When the final course selections were made, another request for data was made to the University of Wisconsin–Stout Registrar's office. The data collected with this request included student demographic data, such as age and gender, as well as the students overall GPA of all courses taken to date and their GPA for the course being studied. This data was then entered into an Excel spreadsheet for the purpose of statistical analysis.

The data was analyzed to identify statistical significance in the method of curriculum delivery (classroom/lecture-based vs. computer-based) as it related to academic achievement. It was also reviewed to looked for a statistical significance in student gender as it related to academic achievement in classroom/lecture-based courses vs. computer-based. The researcher chose independent t-tests as the most effective method available to make a statistically valid determination regarding the factors mentioned.

Summary

In summary, this study used data collected from the UW-Stout Registrar's office starting in the fall semester f 1999 and ending with the summer semester of 2002. All courses studied were offered in both a classroom/lecture-based format as well as a computer-based format. The data collected included student gender, term, course number, course name, and grade received.

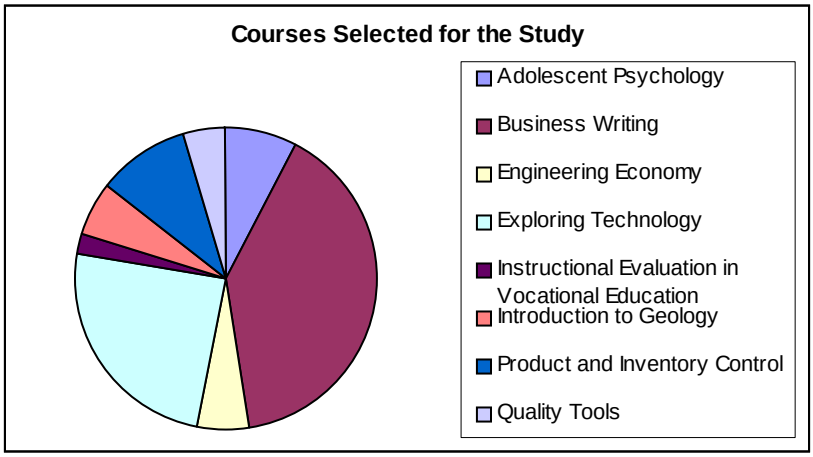
CHAPTER FOUR

Results

The results of this study were based on the following. Between the Fall Semester of 1999 and the Spring Semester of 2003, UW-Stout offered a total of 14639 courses. A total of 8 unique courses offered a total of 102 times by 6 unique departments were chosen for use in this study. The courses were chosen according to the criteria outlined in chapter three and resulted in a good sampling of the various departments, courses, and student body of UW-Stout during the defined time period. The data set included a total of 2,271 students enrolled in the courses selected for the study. Although this would suggest the 2,271 individual students were studied, it is important to point out that since no student identifiers were included in the data set from the Registrar's office, it is not possible to delineate between students enrolling in a single course or multiple courses. Given the variety of courses and the eight-semester time frame studied, it was determined that this did not present a statistically significant issue that would warrant changing the study.

Courses selected for use in this study

The eight courses selected for this study and the number of students enrolled in each course are as follows:



Course Name	Number of Students Enrolled
Adolescent Psychology	179
Business Writing	899
Engineering Economy	130
Exploring Technology	553
Instructional Evaluation in Vocational Education	52
Introduction to Geology	128
Product and Inventory Control	229
Quality Tools	101

The eight courses listed above were offered in both classroom/lecture-based and computer-based. The classroom/lecture-based courses were offered a total of 47 times with a total student enrollment of 1152. The computer-based courses were offered a total of 55 times with a total of 1119 students.

Age and gender statistics

The age of the subjects used for the study spanned 52 years with the youngest student being 17 years old and the eldest student being 69 years of age. The age of the subjects use for this study were representative of the typical public university with and average age or mean of a little over 25.5 years of age and the median being 22 years old. The percentage of men and women studied were almost equal with the men outnumbering the women by only three percent. The total number of men studied was 1175 while the number of women studied totaled 1096.

Research Questions

This study attempted to answer three questions regarding student success in computer-based courses:

1. Is there any correlation between student success and the method of curriculum delivery (traditional classroom/lecture vs. computer based self-paced)?

Student success was determined by grade-point-average (GPA) achieved by each student for the courses being studied. The study used a 4.0 grading scale with 0 being failure and 4.0 being the highest possible score.

The study found that students (n=1152) enrolled in classroom/lecture-based courses earned an average (mean) combined GPA of 2.96 on a 4.0 scale with a standard deviation of 0.88. The most commonly earned grade (mode) was “B”, with 19 % (n=223) of the students receiving this grade.

The study found that students (n=1119) enrolled in computer-based courses earned an average (mean) combined GPA of 3.08 on a 4.0 scale with a standard deviation

of 1.11. The most commonly earned grade (mode) was “A”, with 30 % (n=338) of the students receiving this grade.

When using grade-point-average as the test variable and course format as the grouping variable, the t-test indicates there is no statistically significant difference at the .05 level between the students that attended classroom/lecture-based courses when compared to those attending computer-based courses.

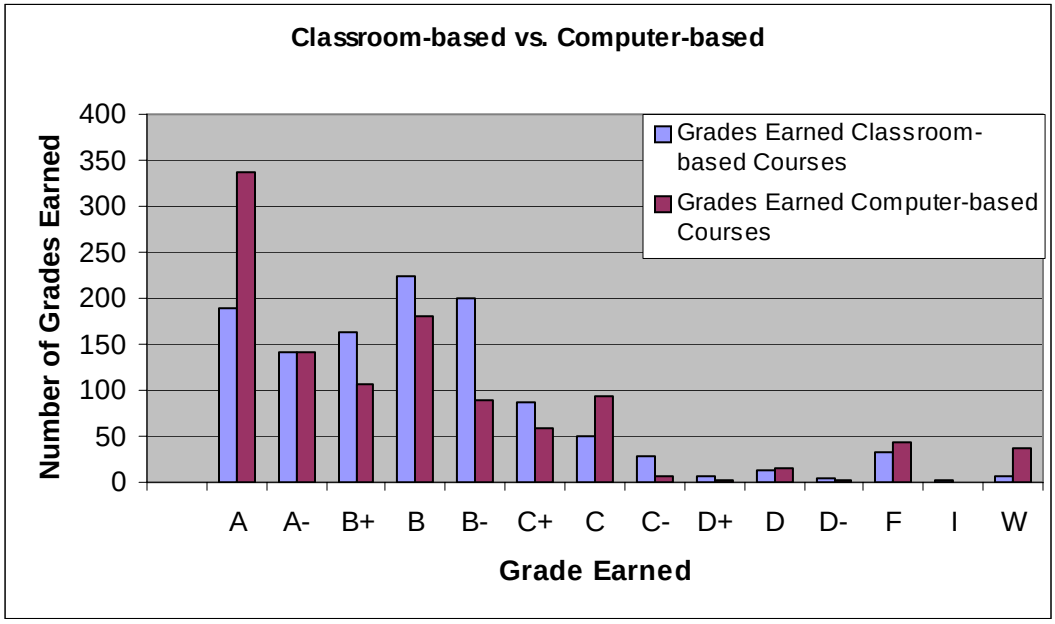
Students that withdrew (W) from the course or received an incomplete (I) were not included in the calculations for this study. However, it is interesting to point out that significantly more students withdrew from computer-based courses (n=36) than those withdrawing from classroom/lecture-based courses (n=6).

Table 1 details the occurrence of each grade achieved according to the format of the course offering.

Table 1

Grade	Grades Earned Classroom-based Courses	Grades Earned Computer-based Courses
A	189	338
A-	142	142
B+	164	107
B	223	180
B-	201	89
C+	88	59
C	51	94
C-	29	7
D+	7	3
D	14	16
D-	4	3
F	32	44
I	2	1
W	6	36

Grade Point Average (mean) Excluding I, W	2.96	3.08



2. Is there a relationship between student gender and success in traditional classroom/lecture courses?

Again, student success was determined by grade-point-average (GPA) achieved by each student for the courses being studied. The study used a 4.0 grading scale with 0 being failure and 4.0 being the highest possible score.

The study found that female students (n=571) enrolled in classroom/lecture-based courses earned an average (mean) combined GPA of 3.14 on a 4.0 scale with a standard deviation of 0.83. The most commonly earned grade (mode) was “A”, with 21 % (n=122) of the students receiving this grade.

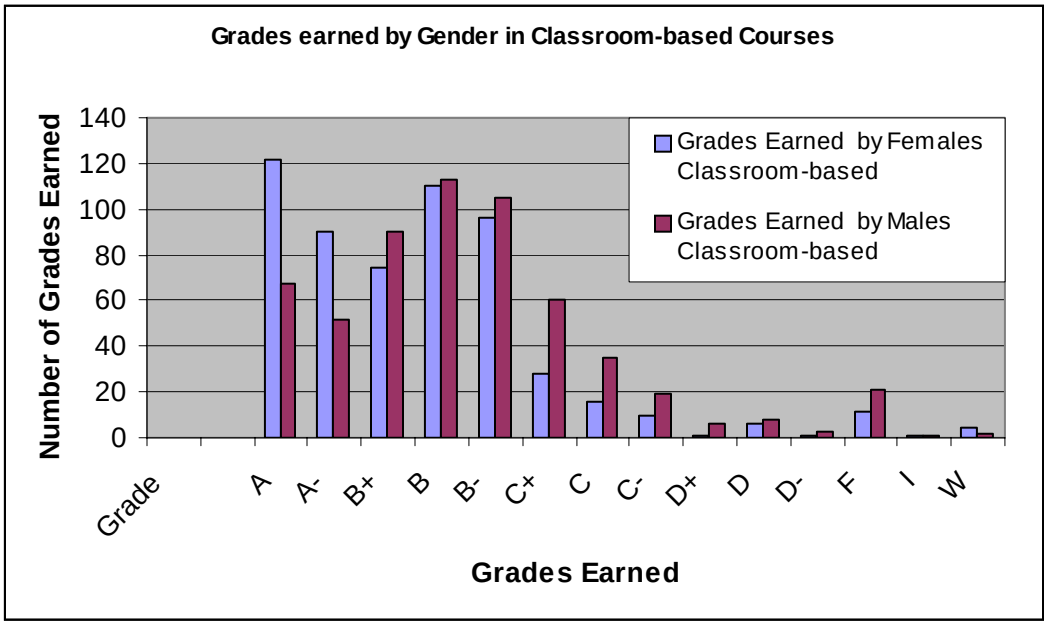
The study found that male students (n=583) enrolled in classroom/lecture-based courses earned an average (mean) combined GPA of 2.81 on a 4.0 scale with a standard deviation of 0.90. The most commonly earned grade (mode) was “B”, with 30 % (n=113) of the students receiving this grade.

When limiting the analysis to classroom/lecture-based courses only, using grade-point-average as the test variable and gender as the grouping variable, the t-test indicated there is no statistically significant difference at the .05 level between the female and male students enrolled in classroom/lecture-based courses.

Table 2 details the occurrence of each grade achieved according to the gender of the student enrolled in the classroom/lecture-based course.

Table 2

Grade	Grades Earned by Females Classroom-based Courses	Grades Earned by Males Classroom-based Courses
A	122	67
A-	90	52
B+	74	90
B	110	113
B-	96	105
C+	28	60
C	16	35
C-	10	19
D+	1	6
D	6	8
D-	1	3
F	11	21
I	1	1
W	4	2
Grade Point Average (mean) Excluding I, W	3.14	2.81



3. Is there a relationship between student gender and success in computer-based self-paced courses?

Again, student success was determined by grade-point-average (GPA) achieved by each student for the courses being studied. The study used a 4.0 grading scale with 0 being failure and 4.0 being the highest possible score.

The study found that female students (n=528) enrolled in computer-based courses earned an average (mean) combined GPA of 3.16 on a 4.0 scale with a standard deviation of 0.99. The most commonly earned grade (mode) was “A”, with 35 % (n=185) of the students receiving this grade.

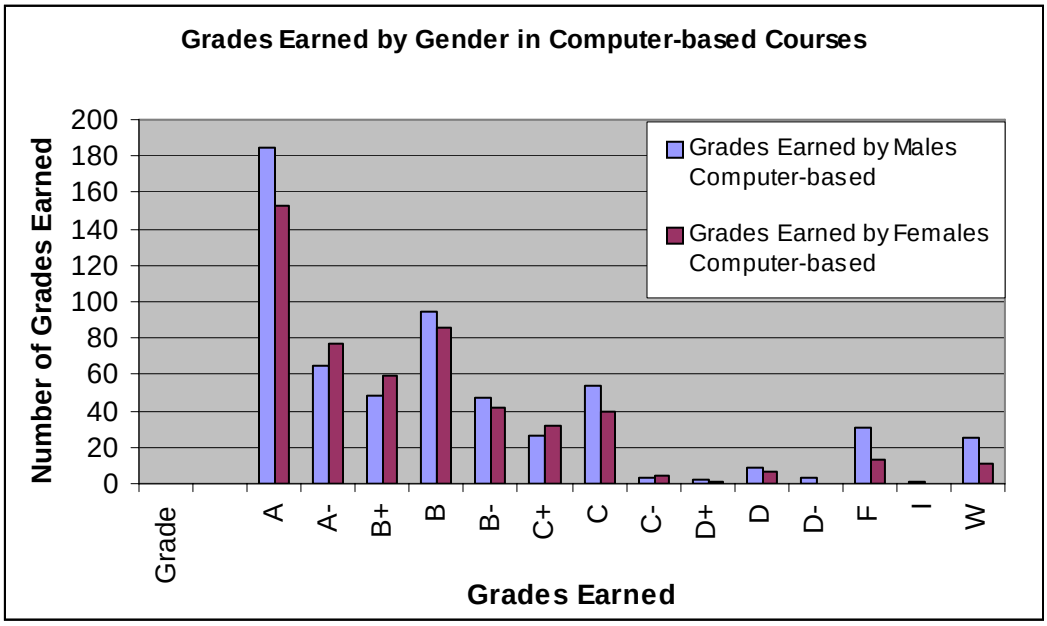
The study found that male students (n=593) enrolled in computer-based courses earned an average (mean) combined GPA of 3.07 on a 4.0 scale with a standard deviation of 1.21. The most commonly earned grade (mode) also was “A”, with 26 % (n=153) of the students receiving this grade.

When limiting the analysis to computer-based courses only and using grade-point-average as the test variable and gender as the grouping variable, the t-test indicates there is no statistically significant difference at the .05 level between the female and male students enrolled in computer-based courses.

Table 3 details the occurrence of each grade achieved according to the gender of the student enrolled in the computer-based course.

Table 2

Grade	Grades Earned by Males Computer-based Courses	Grades Earned by Females Computer-based Courses
A	185	153
A-	65	77
B+	48	59
B	94	86
B-	47	42
C+	26	32
C	54	40
C-	3	4
D+	2	1
D	9	7
D-	3	0
F	31	13
I	1	0
W	25	11
Grade Point Average (mean) Excluding I, W	3.07	3.16


Grades Earned by Gender in Computer-based Courses
Number of Grades Earned
200
180
160
140
120
100
80
60
40
20
0
Grades Earned by Males Computer-based
Grades Earned by Females Computer-based
Grade
A
A-
B+
B
B-
C+
C
C-
D+
D
D-
F
I
W
Grades Earned

CHAPTER 5

Summary of findings

Introduction

The final chapter of this study provides a brief overview of the purpose, objectives, and findings of the research conducted in an effort to gain a better understanding of student success and how it relates to the format or method of curriculum delivery. It also attempts to interpret the statistical findings and makes conclusions as they relate to each of the three objectives. Finally, the chapter outlines the recommendations for continued study in the area of the factors that contribute to student success.

Overview of the Study

Technological advancements have brought many possibilities to today's learning environment. These technologies provide access to considerably more educational material than ever before possible. It is up to educators to embrace the technologies that have the potential to improve the learning experience for our students. However, as professionals in the educational arena, instructors are responsible for looking critically at any new technology to determine its effectiveness for students rather than simply adopting the latest educational trend. Computer-based delivery of curriculum is one technological advancement that seems to offer many possible advantages for learners. It is this researcher's opinion that if educators are going to adapt the traditional classroom practices of a face-to-face, lecture-based learning experience and embrace the possibilities that computer-based, self-paced education brings to learners, we must first understand the potential effect this technology will have on the learner.

This research conducted a correlational study which could be used determine the level of educational success learners demonstrate in courses that are offered in both a traditional classroom-based learning experience and a computer-based, self-paced educational model.

The purpose of this study was to compare the grade point average of students who have enrolled in select courses offered by the University of Wisconsin – Stout in both traditional classroom/lecture-based format as well as computer-based self-paced format during the fall semester of 1999 through the fall semester of 2002. Data was collected from the student records database maintained by the University of Wisconsin – Stout's Registrar's office during the spring semester of 2003 and analyzed to discover if the method of curriculum delivery affected student success. The study also looked at gender to determine if there was any difference between the relative success of male students verses female students.

The final chapter of this study provides a brief overview of the purpose, objectives, and findings of the research conducted in an effort to gain a better understanding of student success and how it relates to the format or method of curriculum delivery. It also attempts to interpret the statistical findings and makes conclusions as they relate to each of the three objectives.

The three objectives were;

1. Is there any correlation between student success and the method of curriculum delivery (traditional classroom/lecture vs. computer based self-paced)?

2. Is there a relationship between student gender and success in traditional classroom/lecture-based courses?

3. Is there a relationship between student gender and success in traditional computer-based courses?

Finally, the chapter outlines the recommendations for continued study in the area of the factors that contribute to student success.

Conclusions and Recommendations

Computer-based curriculum delivery has continually gained acceptance in the educational arena over the past 20 years. However, many questions remain unanswered. One such question is;

Research question #1

Is there any correlation between student success and the method of curriculum delivery (traditional classroom/lecture vs. computer-based self-paced)?

Based on the data it can be concluded that students enrolled in computer-based educational experiences, are slightly more academically successful with a mean grade point average of 3.08 as opposed to those enrolled in traditional classroom/lecture-based experiences that earned a mean grade point average of 2.96. Although the 0.12 point delta between the grade point averages of the two curriculums is not statistically significant, this researcher feels it is important to point out that 43% of students enrolled in computer-based courses earned the grade of A or A-. Whereas only 29% students enrolled in classroom/lecture-based courses earned those same grades.

Based on this conclusion it could be said that computer-based curriculum delivery is more effective at providing an educational experience, which allows students to be more academically successful. However, this academic success could be attributed to many factors. This researcher feels that additional studies should be taken to identify the

factors contributing to this difference. Future studies could include a detailed analysis of the rubric utilized for each section. Although this study attempted to gather a representative sample of courses from multiple departments across the UW-Stout campus, this study did not include a detailed analysis of each course rubric. As outlined in the assumptions and limitations of this study, the rubrics of individual instructors may not assess student achievement equally. A difference in grading criteria could be one factor that leads to the discrepancy in student achievement.

Another piece of information provided by the research was the relatively large withdrawal rate found in the computer-based courses (n=36) as compared to traditional classroom/lecture based courses (n=6). During an interview with Nicholle Stone, the coordinator of web-based instructional development at the University of Wisconsin – Stout, two factors could provide an explanation of the withdrawal rate 6 times higher in computer-based courses (Stone, N., personal communication, March 19, 2003).

The first factor contributing to the higher withdrawal rate could be the ignorance of the students regarding the computer-based format of curriculum delivery. Many students make an assumption that computer-based courses do not require the same level of effort required for traditional classroom-based courses. According to Nicholle Stone many students will enroll in computer-based courses with this assumption in mind even though they already have a full load of courses thinking that they will be capable of handling the overload. When they receive the course syllabus from the instructor, they quickly realize the expectations and requirements of the computer-base course are equal to or in some cases greater than the comparable classroom-based course, which leads to withdrawal from the course.

The second factor, which plays a role in the higher withdrawal rates in computer-based courses, is the lack of teacher involvement in computer-based courses. According to Nicholle Stone, most instructors inform their classes of approaching deadlines to withdraw from a course. Since computer-based courses have little or no interaction with an instructor, it is the student's responsibility to remember the withdrawal timeline. Therefore students enrolled in computer-based courses often miss the withdrawal dates. This results in the withdrawal being recorded on their transcripts.

Research Question #2

Is there a relationship between student gender and success in traditional classroom/lecture courses?

The data collected from the UW-Stout Registrar's office showed an almost even split between the student population of males (n=571) and females (n=583) enrolled in traditional classroom/lecture-base courses. Based on this data we can conclude that there is no gender-based preference regarding enrollment in traditional classroom/lecture-based courses.

The data also showed that female students earn a mean grade point average of 3.14 on a 4.0 scale. The male sample population earned a mean grade point average of 2.81 on a 4.0 scale. The delta between the mean grade point averages of male students and female students is equal to 0.33. 37% of all females taking classroom/lecture-based courses earned the grade of A or A-, whereas 20% of the male sample population earned that same grade. Based on this data we can conclude that females are more academically successful than males in traditional classroom-lecture-based courses.

This researcher feels that addition research should be conducted to determine if factors such as the social aspect and the highly structured nature of classroom-based courses contributes to this difference.

Reference question # 3

Is there a relationship between student gender and success in computer-based self-paced courses?

The data collected from the UW-Stout Registrar's office showed that female students (n=528) earn a mean grade point average of 3.16 on a 4.0 scale. The male sample population (n=593) earned a mean grade point average of 3.07 on a 4.0 scale. The delta between the mean grade point averages of male students and female students is equal to 0.09. 44% of all females taking computer-based courses earned the grade of A or A-, whereas 42% of the male sample population earned that same grade. Based on this data we can conclude that female and male students are almost equally successful in computer-based educational experiences. This researcher would not recommend that any additional research be done regarding this finding.

Recommendations for additional research

There are many aspects of any learning experience that can affect student grades in a given class. The primary means of evaluating a students abilities are either cognitive or what a students knows about the lessons being taught, psychomotor or what a student can do based on the lessons being taught or affective or what a student feel about a lesson. All three of these methods of assessing a student's abilities can be accomplished in a classroom setting. However, computer-based learning presents some unique challenges to the task of student evaluation. Since the definition of computer-based

learning included limited contact with an instructor, it is somewhat more difficult to assess a student's physical abilities and emotional attitudes without direct contact with an instructor.

Based on the literature review as well as the statistical findings of this study it is the recommendation of this researcher that additional studies be conducted to determine the effect of grading styles or rubrics may have on student achievement.

Based on the findings of the study this researcher feels that detailed information regarding any differences in the rubrics, grading policies or expectations of instructors in like courses (ie. Classroom-based Business Writing and Computer-based Business Writing) should be analyzed to determine the similarities and differences between instructional formats. The study of individual styles, policies and rubrics would provide valuable information that could help identify one possible contributing factor for the relatively high number of A's in computer-based courses (mean = 43%) when compared the number of A's earned in similar classroom-based courses (mean = 29%).

Another aspect of the study that this researcher feels warrants additional study and would add value to the findings of this study and be would be an investigation into the reason for the relatively high withdrawal rate in computer-based courses. The interview with Nicholle Stone provided some insight into possible causes for the withdrawal rate 6 times higher that the withdrawal rate of classroom-based courses provided a basic level of understanding of possible contributing factors. However, these insights were based on personal observations and experiences rather than a statistical analysis of the causes for the phenomena.

A study of teacher and student opinion in regards to preference in computer-based and classroom-based courses is another area that could supplement the findings of this study. The study of student opinion could provide valuable information that could lead to a better understanding of student motivations regarding the format of instruction. This information would help educators to adjust their teaching styles in both computer-based and classroom-based learning experiences to improve student success and appreciation for learning. The study of teacher opinions would provide valuable information for administrators regarding the teacher's need for training or equipment.

What may the future hold for classroom-based and computer-based educational experiences?

According to a study conducted by Schlosser and Anderson learners appreciate the flexibility and convenience that are inherently part of the computer-based learning experience. However, they preferred the traditional classroom (Schlosser and Anderson, 1994).

Based on the Schlosser and Anderson study as well as other findings of the literature review, this researcher feels that educators and students are approaching a shift in philosophies that have separated the two teaching methods. The current model includes an either-or situation of traditional classroom-based learning or computer-based learning with very little combined use of the benefits of both learning formats. A marriage of classroom-based learning experiences and computer-based learning experiences in the may not be in the distant future. It is my opinion that a highbred learning experience which would include a computer-based learning experience to provide the majority of the new material supplemented by a minimal amount of

traditional classroom-based learning that included a higher level of debate and discussion would take the best of both worlds and provide a superior learning experience for the average student. This model would allow educators to utilize the benefits of computer-base learning such as ease of access, flexible scheduling, customization, and virtually limitless access to information as well as providing the nurturing, socially rich aspects of the traditional classroom-based format of teaching. It is this researchers opinion that the combination of both teaching methods will provide the most flexible and academically challenging scenario for the entire student body regardless of age, gender or nationality.

REFERENCES

Berryman, S. E. (1993). Learning for the workplace. *Review of Research in Education,* 19, 343-401.

Cerf, V., & Schultz, C. (2002) Teaching in 2025: Education and technology transformed In U.S. Department of Commerce (Ed.), *2020 Visions transforming education and training through advanced technologies* (pp. 1-4). Washington, DC: U.S. Department of Commerce.

Confucius (n.d.) *GIGA quotes by author Confucius*. Retrieved February 19, 2003, from: http://www.giga-usa.com/gigaweb1/quotes2/quautconfuciusx001.htm

Griffin, J. C. (1991). *The effect of computers on secondary remedial writing* (Practicum Report, Nova University). Fort Lauderdale, FL. (ERIC Document Reproduction Service No. ED 340 018)

Hativa, N., & Becker, H. J. (1994). Computer-based integrated learning systems: Research and theory. *International Journal of Educational Research, 21*(1), 1-119.

Jewett, F. (2000). A framework for the comparative analysis of the costs of classroom instruction vis-à-vis distributed instruction. In M. J. Finkelstein, C. Frances, F. I. Jewett, & B. W. Scholz (Eds.), *Distance, dollars, and online education: The new economics of college teaching and learning* (pp. 85-122). Phoenix: Oryx Press.

Kerka, S. (2002), *Teaching adults is it different, myths and realities.* ERIC Educational Resources Information Center, No. 21.

Lewis, L., Snow, K., Farris, E., & Levin, D. (1999). *Distance education at postsecondary education institutions: 1997-199*8. NCES 2000-013. Washington, DC: U. S. Department of Education.

Mariani, M. (2001). Distance learning in postsecondary education: Learning whenever, wherever. *Occupational Outlook Quarterl*y, *4*5(2), 2-10.

NOIE Access Branch. (2002). *Broadband in education: Availability, initiatives and issues* (p. 4). Canberra, ACT: Commonwealth of Australia. National Office for the Information Economy

North Central Regional Educational Laboratory, (n.d.). *The behavioral learning approach.* Retrieved March 3, 2003, from: http://www.ncrel.org/tplan/cbtl/phase1.htm

Pruitt-Mentle, D. (2001). *Satallite Academy presentation.* University of Maryland Partnership, Retrieved March 31, 2003, from: http://edtechoutreach.umd.edu/Presentations/Frederick/Satellite2001_Aug1.ppt

Phipps, R., & Merisotis, J. (1999). *What's the difference? A review of contemporary research on the effectiveness of distance learning in higher education*. Washington, DC: The Institute for Higher Education Policy

Romiszowski, A. J., & Mason, R. (1996). Computer-mediated communications. In D.H. Jonassen (Ed.), *Handbook of research for educational communications and technology*. New York: Simon & Schuster Macmillan.

Rubinstein, G. (n.d.). Retrieved February 18, 2003, from: http://www.digitalcentury.com/encyclo/update/print.html

Ruzena, B. (n.d.). Technologies and Learning. *2020 Visions Transforming Education and Training Through Advanced Jones telecommunications & multimedia Encyclopedia Technologies,* 1-3. Washington, DC: U.S. Department of Commerce.

Ryan, A.W. (1991). Meta-analysis of achievement effects of micro-computer applications in elementary schools. *Educational Administration Quarterly, 27*(2), 161-184.

Saettler, P. (1990). *The evolution of American educational technology*. Englewood, CO: Libraries Unlimited.

Sankaran, S. R., Sankaran, D., & Bui, T. X. (2000). Effect of student attitude to course format on learning performance: An empirical study in web vs. lecture instruction. *Journal of Instructional Psychology, 27*(1), 66-73.

Scholsser, C.A., & Anderson, M. L. (1994). *Distance Education: Review of the literature. Accociation for Educational Communications and Technology.* Washington, DC. (ERIC Document Reproduction Service No. ED 382 159)

Stone, N., (2003). *Course web development options at Stout.* Retrieved March 3, 2003, from: http://www.uwstout.edu/solutions/lts/webid/development.html

Stout Solutions. (n.d.). *US Internet industry association*. Retrieved February 27, 2003, from: http://fasttrack.uwstout.edu/usiia/overview.htm

Tyson, J. (n.d.). *How movie projectors work.* Retrieved February 18, 2003, from: http://www.howstuffworks.com/movie-projector6.htm.

University Registration. (2002, March). *Calculating your grade point average.* Retrieved April 9, 2003, from: http://www.uwstout.edu/regrec/timetable/gpa.html

University Relations (November 2000) *An introduction to University of Wisconsin–Stout*. Retrieved April 9, 2003, from: http://www.uwstout.edu/geninfo/intro.html

Utah Education Network. (n.d.). *Streaming FAQ*. Retrieved April 9, 2003, from: http://www.uen.org/technical/pdf/Streaming.pdf

UW-Stout. (2002, March). *The student view*. Retrieved April 9, 2003, from: http://www.uwstout.edu/ur/np/2002/fea_stuview.html

U.S. Department of Commerce. (2002). *2020 Visions transforming education and training through advanced technologies.* Washington, DC: U.S. Department of Commerce.

Wilson, E. (2002). Computer learning hits its stride. *C&EN West Coast News Bureau, 80(*37), 35-39.

Wilson, L. (1993). *Enhancing the academic skills of adolescent students with learning disabilities through computer-assisted instruction.* Centre for Learning Assistance & Research, Mount Allison University, Sackville, New Brunswick, Canada. (ERIC Document Reproduction Service No. ED 377 898)